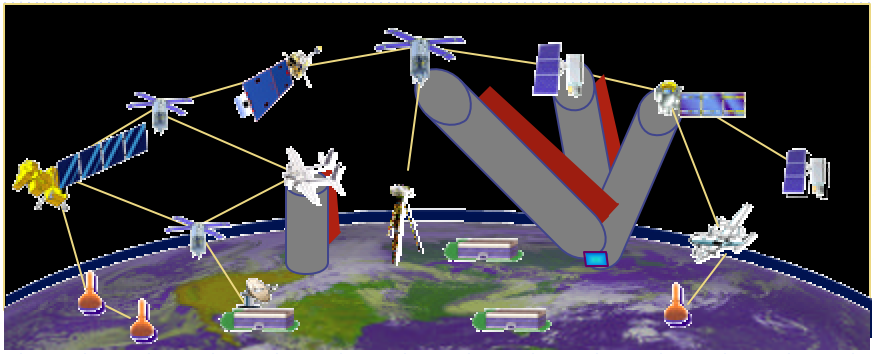
Sensor Webs: *Enabling a New Era in Science and Discovery*

"The best way to be ready for the future is to invent it."
John Sculley – CEO, Apple Computer

A Candidate 2003 NASA Academy Group Project

A sensor web may be characterized as...

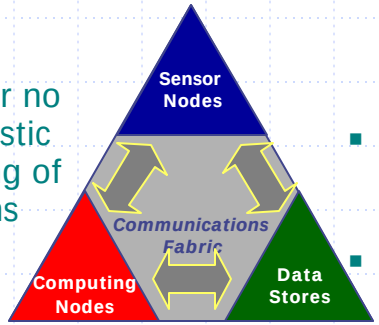
...a distributed system of sensing nodes interconnected by a communications fabric and that functions as a single, highly coordinated, virtual instrument. It detects, and dynamically reacts to, observed phenomenon and events, instrument measurements, and information from constituent nodes and "external" nodes (e.g, a weather forecast model). It then modifies its observing state so as to optimize future observations and maximize science information return.



Credit: *NASA/GSFC: 2000 Survey of Distributed Spacecraft Technologies and Architectures for NASA's Earth Science Enterprise in the 2010-2025 Timeframe*

Background

- Today's Earth observation systems operate as classic "stovepiped" science missions: independent spacecraft missions with little or no dynamic planning for opportunistic science observations or handling of unexpected observing conditions
- No real time event detection, reconfiguration, and reaction
- No collaborative information sharing between sensors, spacecraft, and *in situ* instruments
- Little, if any, on-board science planning or instrument data processing



Project Description

- Research current initiatives by Government, industry, and academia relative to: "sensor networks" [DoD]; "sensor webs" [NASA]; & "cyberinfrastructure" [NSF].
- Characterize a scenario in a science domain of interest to GSFC (e.g., oceanography) where a sensor web observing system would be beneficial.
- Compare and contrast current vs. future systems to make observations and return science information. What specific benefits would the sensor web provide to GSFC scientists?
- Identify how emerging technologies in engineering (e.g., MEMS), communications (e.g, ad hoc networks, protocols), Information Technology (e.g., information fusion, data mining, metadata representation – XML) are applied to the scenario.

Stephen J. Talabac, NASA/GSFC